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Design of the Target Area for the National Ignition Facility

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The preliminary design of the target area for the National Ignition Facility (NIF) has been completed. The target area is required to meet a challenging set of engineering system design requirements and user needs. The target area must provide the appropriate conditions before, during, and after each shot. The repeated introduction of large amounts of laser energy into the chamber and subsequent target emissions represents new design challenges for ICF facility design. Prior to each shot, the target area must provide the required target illumination, target chamber vacuum, diagnostics, and optically stable structures. During the shot, the impact of the target emissions on the target chamber, diagnostics, and optical elements is minimized so that the workers and public are protected from excessive prompt radiation doses. After the shot, residual radioactivation is managed to allow the required accessibility. Diagnostic data is then retrieved, operations and maintenance activities are conducted, and the facility is ready for the next shot. The target area subsystems include the target chamber, target positioner, structural systems, target diagnostics, environmental systems, and the final optics assembly. The engineering design of the major elements of the target area requires a unique combination of precision engineering, structural analysis, opto-mechanical design, random vibration suppression, thermal stability, materials engineering, robotics, and optical cleanliness. The facility has been designed to conduct both x-ray drive and direct drive targets. The NIF has been configured to provide a wide range of experimental environments for the anticipated user groups of the facility. The design status of the major elements of the target area is described.

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